

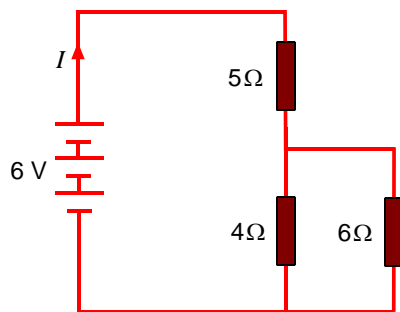
## TAP 114- 3: Circuit resistance

### Simplifying circuits

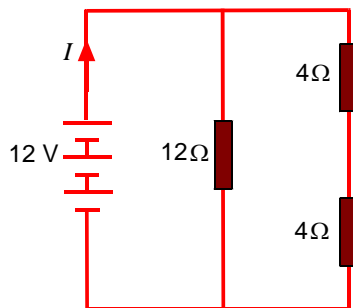
These are questions about replacing many resistors with one resistor which draws the same current from the cell. Study the circuit diagrams and try to simplify sections of the circuit by putting in an equivalent value resistor. Redraw the diagram for each step until you are reduced to one equivalent resistor before calculating the current. Many of these problems are easier if you think about conductance rather than resistance.

For each circuit find the current drawn from the power source.

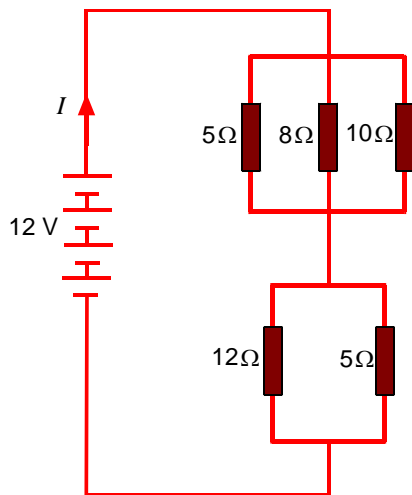
1.



2.

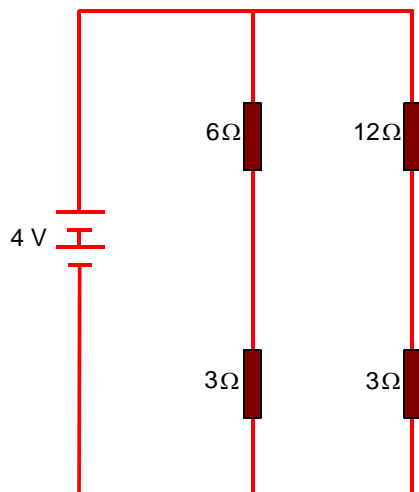


3.



In this circuit calculate:

4. The current through the  $6\Omega$  resistor.
5. The potential difference across the  $12\Omega$  resistor.



### Hints

1. Start with the parallel combination.
2. Start with the series combination.
3. Tackle each parallel combination first.
4. Current through resistor = branch current = pd / total branch resistance.
5. Calculate the branch current and then pd = resistor value x current through it.

### Answers and worked solutions

1. 0.8 A
2. 2.5 A
3. 2 A
4. 0.44 A
5. 3.2 V

1. Circuit current = 0.8 A (Equivalent resistor for parallel arrangement = 2.4 W; total circuit resistance = 7.4 W)
2. Circuit current = 2.5 A (Equivalent resistor for series arrangement = 8 W; Total circuit resistance = 4.8 W) or current =  $12\text{ V} / 12\text{ W} + 12\text{ V} / 8\text{ W} = 2.5\text{ A}$
3. Circuit current 2 A = (Equivalent resistor for the parallel arrangements: 2.35 W and 3.53 W; Total circuit resistance = 5.88 W)
4.  $I = 4\text{ V} / (3\text{ W} + 6\text{ W}) = 0.44\text{ A}$
5.  $\text{pd} = 3.2\text{ V}$  ( $I\ 12\text{ W} = 4\text{ V} / (12\text{ W} + 3\text{ W}) = 0.27\text{ A}$ ;  $V\ 12\text{ W} = 0.27\text{ A} \times 12\text{ W} = 3.2\text{ V}$ )

### External references

This activity is taken from Advancing Physics Chapter 2, 130S